MONTHLY NOTICES

OF THE

ROYAL ASTRONOMICAL SOCIETY.

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WILLIAM LASSELL, Esq., President, in the Chair.

Edward Dent, Esq., 12 Hyde Park Gardens;
James Dyson Perrins, Esq., Davenham Bank, Malvern; and
Charles Henry Gatty, Esq., Felbridge Park, East Grinsted,
were balloted for and duly elected Fellows of the Society.

Meteorological Observations taken at Gibraltar.
By Lieut. Alexander B. Brown, R. A.

Since some discussion has been entered into with respect to a suitable station for observing the total phase of the Solar Eclipse of December 22nd, 1870; and as it is absolutely necessary for the satisfactory carrying out of our experiments that we should have a clear or moderately clear sky, I have much pleasure in submitting to the Society some extracts from my meteorological notes taken in Gibraltar from 1860 to 1867. From that date (1867) to the present time I have fallen back (for the last two years) to well authenticated observations.

I should remark that at Gibraltar,—

b means blue sky, quite or almost quite free from cloud;
c means much or little blue sky with cloud;
f, fog; *m*, mist; *g*, gloomy; *r*, rain; *p*, passing showers.

As respects force of wind,—

1, light air; 2, light breeze;
3, gentle breeze; 4, moderate breeze;
5, fresh breeze; 12, hurricane.

Notes on 22nd December.

	Wind.	Force.	Barometer.	Sky.
1860, Dec. 22	SW, W	6	29·93	Fog
1861, ,,	SW, SSW	5	29·78	Showery
1862, ,,	WNW	3	30·01	Blue sky
1863, ,,	NE, WNW	2	30·23	Blue sky
1864, ,,	ENE, NE	2	30·00	Blue sky, with cloud
1865, ,,	SE, ESE	4	30·25	Cloudy
1866, ,,	E	3	30·24	Blue sky, with cloud
1867, ,,	W	4	30·16	Blue sky
1868, ,,	WSW, SW	5	30·13	Blue sky
1869, ,,	WNW	5	30·07	Blue sky, with cloud

Meteorological Notes of 17 Days, from 15 to 31 December (inclusive) for past 10 years.

17 Days. 15–31 December.	Average Wind.	Force of Wind.	*b.*	*c.*	*f, m.*	*g.*	*r.*	*p.*
1860	WNW, SW	5	6	6	4	1	..	..
1861	NE, SE	4	3	5	1	1	6	1
1862	WNW, ENE	3	10	6	1	..	..	..
1863	WNW	3	13	3	..	..	1	..
1864	WNW	4	5	10	1	..	..	1
1865	E, ENE, ESE	2	12	4½	..	..	½	..
1866	E, ESE	4	6	9	2	..	..	..
1867	W, WNW	3	8	5	1	..	½	2½
1868	WNW	5	11	5	..	..	1	..
1869	WNW	5	7	9	½	..	..	½

The numbers in the last six columns show for each year how many of the 17 days were *b*, *c* ; *f*, *m* ; *g*, *r*, or *p*, respectively; the total in each line being of course = 17. The observations being taken at 9 A.M. and 3 P.M., ½ days have been introduced.

We thus see then, out of the last 10 returns of 22nd December, there were

4 very good observing days;
3 fair ditto ;
1 not quite so good ;
1 in which probably little could be done; and
1 useless for observation of the Sun.

That from the 15th to 31st December in the

Years 1860	6 very good days	6 fair days	5 indifferent
1861	3 ,,	5 ,,	9 ,,
1862	10 ,,	6 ,,	1 ,,
1863	13 ,,	3 ,,	1 ,,

Years	1864	5	very good days	10	fair days	2 indifferent
	1865	12	„	4½	„	½ „
	1866	6	„	9	„	2 „
	1867	8	„	5	„	3 „
	1868	11	„	5	„	1 „
	1869	7	„	9	„	1 „

which I think we may consider very satisfactory.

On his Photographs taken during the Total Solar Eclipse, Aug. 7, 1869. By Commander Ashe.

(*Letter addressed to the Editor of the Monthly Notices.*)

In the *Monthly Notices* of the Astronomical Society of Feb. 11, 1870, in the Council Report, at page 108 (in reference to the four negatives taken during totality at Jefferson Town) are these words, — "Unfortunately, in photographs 3 and 4, there is evidence of the disturbance of the telescope during the exposure of the sensitive plate."

Now I beg to state there is no evidence of the sort, and by the enclosed print of an enlarged copy of No. iv. I clearly prove that no disturbance of the telescope took place. I have given ample evidence to the Astronomer Royal that the telescope was not disturbed; but if there was nothing else, the photograms taken at Des Moines (the next station to us), would prove it, for, in the photogram taken near the end of totality, are seen the stumps of the three parallel planes of light that are seen in No. iv. photogram at E. My negative was taken as near the limb of the Sun as it is possible to take it, for just as I closed the slide the Sun burst out, and this remarkable photogram shows two bright bands divided by a dark band. What are they? They are crossed by rays of light that do not radiate from the Sun's centre, but are all parallel to each other. It must be remembered that no other party was looking at the totality at the same time that we were, for just as it ended at Jefferson it commenced at Des Moines.

Now, with reference to my photograms "confirming what has already been stated in regard to the identity of form preserved by the protuberances," I will now relate a fact that was seen by all at Jefferson, and by Mr. Falconer, whose address is Alexander Plytts Falconer, Esq., Bath County Club, Bath, and may be referred to. The point of light that is seen in No. i., and is described by all the American astronomers, on the "great protuberance" — whilst I was waiting for No. iii. plate — shot out to an enormous length, at least one-third longer than it is seen in No. iii. photogram; and when it reached its greatest height (which

it did in a few seconds), the top was blown off at right angles and came to a point, just like a flame acted on by a blow-pipe. The lower part was deep red, getting lighter, and the part blown off was a brilliant white light. Now then let us investigate the evidence. Although this is my second total eclipse, still my surprise and love of the marvellous might be supposed to have produced in my bewildered mind an impression that did not exist in reality. If I were the only one who saw it, then it might very readily be put down to fancy, but all those who came out from the town, and were standing round the observatory, saw it, and the crowd produced that sensational murmur that they did when the totality commenced. One man described it as a crooked piece of iron taken from a forge "white hot" at the top. But Mr. Falconer, who was then travelling in America, gave me a very good drawing of it, and who no doubt will, if written to, corroborate my statement.

Now I state that a few seconds after it had reached its greatest height, it lost the flame-like appearance, and became a duller red, and quickly reduced its height; and when No. iii. negative was taken, it was apparently a cinder; and when this negative is examined by a lens, it shows cracks and various lines, that were also seen by Mr. Vail, who observed the eclipse with a small telescope. Now, supposing that we *all* agreed to foist this marvellous story on the public, still there is the photogram No. iii., which shows an enormous protuberance, which was fast crumbling away; and on examining No. iv. negative, we see it greatly reduced; but still it has the same characteristic form. Now look at the "Des Moines" photogram. Here we see that it has assumed the form of a great heap of cinders, but the long exposure, 66 seconds, has softened the outlines.

After the protuberance has taken this form, then it naturally retains it for some time, and thus all the other stations to the eastward have very similar photograms.

In common justice to our party I have to request that this communication may be printed in the *Monthly Notices* of the Society. And, in conclusion, I beg that the negatives may be returned to me, as I am about to print my Report.

Observatory, Quebec, April 14, 1870.

A Committee appointed by the Council unanimously report that, in their opinion, there was a decided movement of the instrument at the time the photograph was taken. This conclusion they arrived at from an examination of the chromosphere close to the Moon's limb, as well as from an examination of the prominences.

Observations of an Occultation of Saturn by the Moon; of Occultations of Stars by the Moon; and of Phenomena of Jupiter's Satellites; made at the Royal Observatory, Greenwich, from 1869, *April, to* 1870, *April.*

(*Communicated by the Astronomer Royal.*)

Occultation of Saturn (*Disappearance and Reappearance*), 1870, *April* 19.

Phenomenon.	Greenwich Mean Solar Time of Observation. Hour and Minute.	Seconds observed by E.	C.	J. C.
	h m	s	s	s
First Contact with Ring	14 55	49·8	55·5	50·8
First Contact with Ball	14 56	13·8	17·4	16·7
Total Disappearance of Ball	14 56	44·7	53·3	60·1
Total Disappearance of Ring	14 57	15·6	16·8	24·6
First Reappearance of Ring	16 4	...	34·2	33·5
First Reappearance of Ball	16 5	...	0·1	0·4
Last Contact with Ball	16 5	...	40·5	44·3
Last Contact with Ring	16 6	...	5·4	6·2

Notes by E.—With the Altazimuth and a power of about 100. The first three times probably uncertain to 1^s or 2^s; the last still more uncertain, the light of the planet by contrast with the Moon being extremely faint.

By C.—With the Sheepshanks Equatoreal and a power of 64. The observations of the disappearance were not considered good, owing to the great faintness of the planet on approaching the bright limb of the Moon; the first contact with the limb of *Saturn* being the best. The observations of the reappearance were considered pretty good; those of the first limb of the planet and last contact of ring being thought the most accurate. There was not the least trace of alteration of the planet's form noticed; in fact, the Moon's limb at the reappearance seemed to divide the planet with extraordinary sharpness. Owing to the amount of colour on *Saturn*, in order to get a good image I reduced the aperture of the object-glass to $4\frac{1}{2}$ inches; this gave a very nice image indeed.

By J. C.—With the Great Equatoreal and a power of 340. At disappearance the planet was a very dull object when in contact with the Moon; its light probably a twentieth as bright. The times noted are probably correct to a second, except the last, which is doubtful to two or three seconds. At reappearance the planet was rather tremulous; no distortion whatever was noticed.

Occultations of Stars by the Moon.

Day of Observation.	Phenomenon.	Moon's Limb.	Mean Solar Time.	Observer.
1869.			h m s	
June 23	(*a*) μ^1 Sagittarii, disappearance	Bright	10 53 22·5	D.
Aug. 2	Aldebaran, reappearance	Dark	13 13 39·8	J. C.
Dec. 14	ξ^2 Ceti, disappearance	Dark	9 20 17·5	E.
1870.				
Feb. 10	*m* Tauri, disappearance	Dark	9 8 16·3	E.

(*a*) The star very faint at disappearance.

Phenomena of Jupiter's Satellites.

Day of Obs.	Satellite.	Phenomena.	Mean Solar Time. h m s	Observer.
1869.				
Oct. 5	I.	Eclipse, disappearance	12 44 55·9	H.C.
21	III.	Eclipse, disappearance	8 50 45·6	C.
	III.	Eclipse, reappearance	10 32 43·9	C.
	III.	(*a*) Occult. disappearance, bisection	10 55 10·2	C.
	I.	Eclipse, disappearance	11 2 59·0	C.
Nov. 15	III.	Transit, ingress, first contact	10 13 16·0	J. C.
	III.	,, ,, bisection	10 21 44·6	J. C.
	III.	Transit, egress, bisection	11 51 29·8	J. C.
	III.	,, ,, last contact	11 57 58·7	J. C.
19	II.	Eclipse, reappearance	13 17 37·2	J. C.
Dec. 14	II.	Eclipse, reappearance	10 22 31·7	E.
15	I.	Eclipse, reappearance	10 3 21·1	D.
1870.				
Jan. 30	I.	(*b*) Eclipse, reappearance	10 37 24·5	S.
Feb. 27	III.	Eclipse, disappearance	9 23 30·0	S.
Mar. 13	II.	(*c*) Eclipse, reappearance	6 52 17·7	J. C.
Apr. 4	III.	(*d*) Eclipse, reappearance	7 18 26·3	E.

(*a*) Owing to the path of the satellite cutting the disc of the planet at a very small chord, and the occultation being little more than a graze, it was impossible to estimate with any accuracy the time of occultation.

(*b*) A haze prevalent; the time noted probably somewhat late.

(*c*) The sky rather bright from daylight.

(*d*) Very faint; the time noted is that at which the satellite was first seen; it conld not have been visible more that a few seconds previously.

The initials S., D., E., C., J. C., and H. C. are those of Mr. Stone, Mr. Dunkin, Mr. Ellis, Mr. Criswick, Mr. Carpenter, and Mr. H. Carpenter.

Occultation of Saturn by the Moon, Tuesday, April 19, 1870.

By Capt. W. Noble.

As this was my first view of *Saturn* this year I occupied myself, from $14^h\ 40^m$ L.M.T., in scrutinising the physical features of the planet before the occultation. I employed a power of 255 on my 4·2-inch Equatoreal, the same with which I subsequently observed the occultation itself.

Notwithstanding *Saturn's* small altitude he was well and sharply defined, Ball's division being visible over the North Pole. The shadow of the ball was of course to the west of it on the rings. The crape ring C was seen in the ansæ very distinctly. *Saturn* appeared of a richly greenish yellow when compared with the brilliant white light of the Moon.

The Occultation.

The first contact of the outer edge of ring A with the Moon's bright limb took place at $16^h\,47^m\,55^s$ L.S.T. $= 14^h\,55^m\,55^s{\cdot}6$ L.M.T. and that of the inner edge of ring B at $16^h\,48^m\,8^s{\cdot}6$ L.S.T. $= 14^h\,56^m\,9^s{\cdot}2$ L.M.T. The preceding limb of the planet touched that of the Moon at $16^h\,48^m\,19^s$ L.S.T. $= 14^h\,56^m\,19^s{\cdot}6$ L.M.T. The globe of *Saturn* was dichotomised (as nearly as I could estimate) at $16^h\,48^m\,33^s$ L.S.T. $= 14^h\,56^m\,33^s{\cdot}5$ L.M.T. His following limb disappeared at $16^h\,49^m\,1^s$ L.S.T. $= 14^h\,57^m\,1^s{\cdot}4$ L.M.T. The inner edge of ring B was occulted at $16^h\,49^m\,13^s$ L.S.T. $= 14^h\,57^m\,13^s{\cdot}4$ L.M.T., and the last perceptible trace of the ring vanished at $16^h\,49^m\,25^s$ L.S.T. $= 14^h\,57^m\,26^s{\cdot}4$ L.M.T. Although very pale the planet was perfectly distinct, and passed behind the Moon's limb without wave, shake, or distortion.

At the reappearance of *Saturn* the first visible trace of the edge of the preceding ansa was caught sight of about $17^h\,57^m\,19^s$ L.S.T. $= 16^h\,5^m\,8^s{\cdot}3$ L.M.T., and at $17^h\,58^m\,1^s$ L.S.T. $= 16^h\,5^m\,50^s{\cdot}1$ L.M.T. the planet was *just* clear of the Moon's limb.

The emersion was very striking, from the exceeding sharpness of *Saturn;* the most delicate detail being perceptible, even in contact with the lunar limb. The crape ring C was seen most perfectly where the dark limb of the Moon crossed it. I never was more impressed with the absolute absence of a lunar atmosphere of any appreciable density than I was on this occasion.

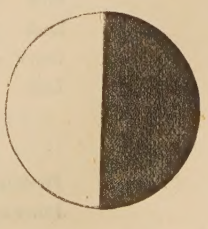
Forest Lodge, Maresfield, Sussex,
May 13, 1870.

Occultation of Saturn. By C. G. Talmage, Esq.

The occultation of *Saturn* was well seen here: at sunset the sky was quite clear, and remained so to sunrise. *Saturn* was visible to the naked eye to within three minutes and a-half of the time of disappearance.

When I first looked at *Saturn*, at about 13^h, no striking difference of colour from the Moon was visible, but by 14^h the difference was quite perceptible, and at $14^h\,45^m$ it was most marked, the planet appearing of a yellow tint.

I had no difficulty whatever in observing both the disappearance and reappearance of *Titan*. To prevent the glare of the Moon I covered the eyepiece half over with silver foil, so that the eye was greatly relieved. The field was, therefore, of the following shape:—



The local mean times are as follows:—

	h	m	s
Disappearance of *Titan* =	14	49	18·97
First contact with ring	14	55	51·90
,, ,, ball	14	56	15·84
Final disappearance of ball	14	56	57·73
,, ,, ring	14	57	17·68
Reappearance of *Titan*	15	58	56·53
,, ,, ring	16	4	31·63
,, ,, ball	16	4	58·56
Ring clear of Moon =	16	6	1·89

I used a power of 110 on the 10-inch refractor.

I believe, had I taken the precaution of getting out the positions of the faint satellites, I could have observed their occultations, as I saw several very faint objects occulted, both preceding and following *Saturn*, and the field was full of stars.

The position of the Observatory is—

Lat. 51° 34′ 34″ N.
Long. $0^h\ 0^m\ 0^s{\cdot}87$ W.

Mr. Barclay's Observatory, Leyton.

Occultation of Saturn. By John Joynson, Esq.

The occultation of *Saturn* by the Moon, on the 19th April last, was seen here as satisfactorily as could be expected, considering the low altitude of the planet. The sky was quite free from cloud at the disappearance, but at the reappearance there was just sufficient hazy cloud about the Moon to interfere with the correct observation of the exact time of the egress of the preceding edge of the ring.

The following were the times noted:—

Disappearance.

	h	m	s	
First contact of ring	14	52	52·7	G.M.T.
Inner ditto ditto		53	2·2	
First ditto of ball		53	22·1	
Last ditto ditto		53	39·6	
Inner ditto of ring		54	2·0	
Last ditto ditto	14	54	10·1	

Reappearance.

First appearance of ring.	Not noted, for hazy cloud.
Inner edge ditto	Not sure ditto

	h	m	s	
First limb of ball	16	0	29·1	G.M.T.
Last ditto ditto		0	46·0	
Inner edge of ring		1	7·3	
Last ditto ditto	16	1	15·9	

Lens $3\frac{1}{2}$ inches; Power 110.

Lat. 53° 28′ 24″ N.
Long. $0^h\ 12^m\ 6^s{\cdot}9$ W.

Waterloo, near Liverpool,
May 10, 1870.

Observations of Algol; of Occultations of Stars and of Saturn by the Moon; and of Sun-spots. By C. F. Penrose, Esq.

The position is

Latitude 51° 24′ 58 N.
Longitude $0^h\ 0^m\ 55{\cdot}1$ W.

Algol.

			G.M.T.
Minima observed by estimation	1869	Oct. 11	$10^h\ 50^m$
	and	Dec. 18	$6^h{\cdot}7$

These observations, which represent the phenomena certainly within 10 minutes, show that the period of 2·86727 days which has been assigned, combined with an epoch given for Jan. 3, 1844, in the *Outlines of Astronomy*, requires a slight correction. These minima occurred nearly 3 hours earlier than if due to those data. The value 2·867234 would better satisfy them.

Occultations as follows:—

1869, Aug. 2.

			G.M.T.
Aldebaran	Reapp.	Dark limb	$13^h\ 13^m\ 37^s$

1870, Feb. 2.

m Tauri	Disapp.	Dark limb	$9^h\ 7^m\ 14^s{\cdot}9$

April 19th.

Saturn.

At Disapp.	Bright limb	G.M.T. h	m	s
First contact of Ring	..	14	55	30
Ball apparently bisected	..		56	17
Final disappearance of Ring	..		57	5

At Reapp.	Dark limb	h	m	s
Ball bisected ..	..	16	5	2
Ring clear of Moon	..		5	52

Of these occultations the two first have been subjected to calculation. That of *Aldebaran* accords with the longitude within a very few seconds. In the case of *m Tauri* the discordance is greater (viz. about 13^s), but the occultation was far from a central one. The Moon seems to have been behind, or above, or both, as repects her tabular place.

Several Sun-spots have been noticed exhibiting a remarkable appearance when near the limb, especially on March 25 and April 25, a sketch of the latter is submitted.

If the Sun-spots are cuplike or conical depressions and symmetrically placed, or nearly so, with respect to a normal or solar plumbline, the breadth of the nearer margin would invariably be less than that of the further margin when near the limb, and would even disappear on approaching it (which is the general phenomenon). That, of which the sketch is submitted, on April 25, was about 25° from the limb, and exhibited its nearer margin equal in breadth to the further one. By the imaginary section through the photosphere it is shown how very oblique must have been the axis of the cavity around the spot on the hypothesis of its cuplike shape.

Colebyfield, Wimbledon.

Note respecting η Argûs. By H. A. Severn, Esq.

(*Extract of Letter addressed to the Astronomer Royal by Henry A. Severn, Union Bank of Australia, Melbourne, Victoria, received April* 1870.)

"I may say that I cannot confirm the new position given to *η Argûs* in respect to the Nebula. I have watched it for 14 years, and it is just where it was; of course much less brilliant."

Instruments, 13 in. front view reflector, of his own construction, and a $3\frac{3}{4}$ in. refractor.

Comparisons of the Places of certain Stars, as given in the Second Radcliffe Catalogue, with the Places given by Dr. Wolfers in the Tabulæ Reductionum. By Dr. Wolfers. Translation.

Extract of a Letter from Dr. Wolfers to the Radcliffe Observer.

"I beg to offer my best thanks for the copy which I have received of the Second Radcliffe Catalogue of Stars, presented to me by the Radcliffe Trustees.

" You will not be surprised that I have, as on former occasions, compared the mean places of the stars therein contained with the places determined by me, since the latter are now in use at several observatories. The agreement is, as in all former comparisons, in general very satisfactory, as you will see by the accompanying copy. I must leave it to your own judgment to determine whether it is proper to communicate the paper to the Royal Astronomical Society. It will be a satisfaction to me if, by this means, the use of the *Tabulæ Reductionum* should be extended.

Comparison of Fundamental Stars (Tab. Red. = W.) *with the Second Radcliffe Catalogue* (M.)

Name.	No. of Obs.	R.A. M.	R.A. W.	R.A. M.—W.	No. of Obs.	Declination. M.	Declination. W.	Declination. M.—W.
		h m s	s	s		° ′ ″	″	″
α Andromedæ	12	0 1 9·38	9·43	−0·05	7	+28 19 3·7	3·3	+0·4
γ Pegasi	21	0 6 1·77	1·86	−0·09	6	+14 24 21·0	18·5	+2·5
α Cassiopeiæ	3	0 32 35·14	35·06	+0·08	6	+55 46 7·3	8·4	−1·1
α Arietis	14	1 59 17·25	17·32	−0·07	2	+22 47 56·4	55·2	+1·2
α Ceti	18	2 54 57·89	57·87	+0·02	4	+ 3 32 17·4	17·0	+0·4
α Persei	5	3 14 20·74	20·80	−0·06	4	+49 21 33·0	33·2	−0·2
α Tauri	19	4 27 53·43	53·46	−0·03	11	+16 13 28·4	28·4	0·0
α Aurigæ	10	5 6 21·06	21·17	−0·11	9	+45 51 2·8	3·4	−0·6
β Orionis	11	5 7 48·62	48·70	−0·08	9	− 8 21 59·2	59·5	+0·3
β Tauri	7	5 17 26·69	26·67	+0·02	7	+28 29 8·2	5·9	+2·3
α Orionis	13	5 47 35·58	35·64	−0·06	11	+ 7 22 38·8	38·2	+0·6
α Canis Maj.	10	6 38 58·63	58·70	−0·07	24	−16 31 36·6	36·2	−0·4
α Geminorum	13	7 25 39·52	39·45	+0·07	15	+32 11 30·5	29·4	+1·1
α Canis Min.	15	7 31 58·35	58·36	−0·01	12	+ 5 34 50·8	50·5	+0·3
β Geminorum	17	7 36 44·64	44·69	−0·05	11	+28 21 39·7	38·9	+0·8
α Hydræ	15	9 20 42·43	42·47	−0·04	8	− 8 3 15·0	12·9	−2·1
α Leonis	20	10 0 54·71	54·78	−0·07	16	+12 38 60·6	59·9	+0·7
α Ursæ Maj.	5	10 55 3·51	3·28	+0·23	16	+62 30 21·4	20·7	+0·7
β Leonis	15	11 41 54·98	55·00	−0·02	6	+15 21 16·1	16·8	−0·7
β Virginis	11	11 43 24·20	24·16	+0·04	5	+ 2 33 12·3	12·9	−0·6
γ Ursæ Maj.	6	11 46 27·25	27·08	+0·17	4	+54 28 22·8	23·2	−0·4
α Virginis	21	13 17 49·29	49·32	−0·03	18	−10 25 46·8	45·3	−1·5
η Ursæ Maj.	13	13 42 1·27	1·25	+0·02	7	+50 0 46·6	47·8	−1·2
α Boötis	11	14 9 16·55	16·62	−0·07	5	+19 54 47·2	47·5	−0·3
8 Libræ	1	14 42 56·89	56·92	−0·03	1	−15 24 47·1	44·9	−2·2
α Libræ	14	14 43 8·32	8·36	−0·04	3	−15 27 27·8	26·5	−1·3
β Ursæ Min.	1	14 51 8·89	9·23	−0·34	7	+74 43 38·8	38·3	+0·5
α Coronæ	14	15 28 45·67	45·71	−0·04	5	+27 11 17·5	18·2	−0·7
α Serpentis	15	15 37 22·43	22·48	−0·05	4	+ 6 52 7·0	8·1	−1·1
α Scorpii	18	16 20 49·70	49·73	−0·03	10	−26 7 2·9	2·4	−0·5
α Herculis	11	17 8 15·87	15·95	−0·08	2	+14 33 11·0	11·0	0·0
α Ophiuchi	26	17 28 26·13	26·23	−0·10	11	+12 39 54·6	54·8	−0·2

Name.	No. of Obs.	R.A. M.	R.A. W.	R.A. M.—W.	No. of Obs.	Declination. M.	Declination. W.	Declination. M.—W.
		h m s	s	s		° ′ ″	″	″
γ Draconis	20	17 53 21·35	21·47	−0·12	6	+51 30 24·8	24·5	+0·3
α Lyræ	14	18 32 11·89	11·94	−0·05	14	+38 39 20·4	20·2	+0·2
γ Aquilæ	21	19 39 36·13	36·25	−0·12	9	+10 16 29·3	29·8	−0·5
α ,,	26	19 43 57·08	57·18	−0·10	15	+ 8 30 5·5	5·5	0·0
β ,,	20	19 48 26·19	26·21	−0·02	8	+ 6 3 34·9	35·6	−0·7
α^1 Capricorni	1	20 9 53·16	53·17	−0·01	4	−12 56 18·7	15·9	−2·8
α ,,	14	20 10 17·08	17·09	−0·01	7	−12 58 35·2	32·6	−2·6
α Cygni	26	20 36 39·47	39·59	−0·12	12	+44 46 52·7	54·2	−1·5
α Cephei	17	21 15 14·18	14·14	+0·04	20	+61 59 35·2	35·0	+0·2
α Aquarii	25	21 58 35·49	35·57	−0·08	6	− 0 59 55·1	54·0	−1·1
α Piscis Austr.	10	22 49 54·40	54·44	−0·04	11	−30 21 47·2	47·5	+0·3
α Pegasi	22	22 57 47·33	47·39	−0·06	9	+14 27 9·3	10·9	−1·6
α Ursæ Min.	14	1 8 2·37	2·65	−0·28	17	+88 33 46·9	47·1	−0·2
δ Ursæ Min.	4	18 17 30·60	30·16	+0·44	17	+86 36 7·4	6 2	+1·2

Comparison of Additional Stars (*Astr. Jahrbuch*, 1867, page 325, = (W)) *with the Second Radcliffe Catalogue* (M).

Name.	No. of Obs.	R.A. M.	R.A. W.	R.A. M.—W.	No. of Obs.	Declination. M.	Declination. W.	Declination. M.—W.
		h m s	s	s		° ′ ″	″	″
β Ceti	13	0 36 33·63	33·63	0·00	5	−18 45 21·9	21·3	−0·6
γ ,,	18	2 36 3·01	3·01	0·00	7	+ 2 38 37·8	37·1	+0·7
δ Arietis	17	3 3 37·74	37·82	−0·08	8	+19 11 40·3	40·1	+0·2
ι Ursæ Maj.	10	8 49 36·36	36·32	+0·04	9	+48 35 17·7	17·6	+0·1
θ ,,	4	9 23 28·32	28·28	+0·04	1	+52 18 48·4	46·3	+2·1
γ^1 Leonis	9	10 12 14·91	14·95	−0·04	4	+20 32 54·0	53·7	+0·3
κ ,,	13	10 57 47·60	47·70	−0·10	9	+ 8 5 30·7	30·9	−0·2
δ ,,	10	11 6 39·39	39·58	−0·19	8	+21 17 25·8	25·0	+0·8
δ Crateris	9	11 12 20·59	20·67	−0·08	7	−14 1 18·1	17·2	−0·9
γ Virginis med.	9	12 34 34·11	34·13	−0·02	4	− 0 40 53·3	51·0	−2·3
12^2 Canum Ven.	7	12 49 28·47	28·46	+0·01	3	+39 4 31·2	31·1	+0·1
ζ Virginis	11	13 27 33·58	33·82	−0·24	5	+ 0 7 14·9	17·9	−3·0
η Boötis	17	13 48 1·15	1·22	−0·07	6	+19 6 3·5	4·0	−0·5
ψ ,,	7	14 58 26·80	26·86	−0·06	4	+27 29 43·9	45·2	−1·3
ζ Ursæ Min.	2	15 49 8·72	8·53	+0·19	4	+78 13 27·5	24·0	+3·5
ζ Herculis	16	16 36 0·57	0·72	−0·15	7	+31 51 32·2	30·7	+1·5
κ Ophiuchi	17	16 51 2·53	2·56	−0·03	7	+ 9 35 44·0	45·3	−1·3
β Draconis	12	17 27 16·12	16·27	−0·15	15	+52 24 23·8	23·4	+0·4
μ Herculis	22	17 40 58·78	58·78	0·00	10	+27 48 18·9	19·9	−1·0
β^1 Lyræ	26	18 44 54·61	54·61	0·00	4	+33 12 9·6	9·0	+0·6
ι Aquilæ	27	19 18 26·30	26·34	−0·04	8	+ 2 50 19·8	19·9	−0·1
61^1 Cygni	18	21 0 37·43	37·39	+0·04	12	+38 3 47·8	47·3	+0·5
γ Piscium	22	23 9 54·42	54·47	−0·05	6	+ 2 31 3·4	4·8	−1·4
ι ,,	18	23 32 45·00	45·13	−0·13	13	+ 4 52 3·7	3 9	−0·2
ω ,,	11	23 52 7·34	7·46	−0·12	6	+ 6 5 16·1	17·9	−1·8

Note on Dr. Wolfers' Paper. Comparison between the Places of the Greenwich Seven-year Catalogue and Radcliffe Catalogue, 1860, for the Stars in Table I. By E. J. Stone, Esq.

	Greenwich Mean Right Ascension.	Rad.	G.—R.	Mean N.P.D.	Rad.	G.—R.
	h m s	″	″	° ′ ″	″	″
α Andromedæ	0 1 9·44	9·38	+ 0·06	61 40 57·79	56·3	+ 1·5
γ Pegasi	0 6 1·79	1·77	+ 0·02	75 35 42·37	39·0	+ 3·4
α Cassiopeiæ	0 32 35·06	35·14	− 0·08	34 13 51·94	52·7	− 0·8
α Arietis	1 59 17·28	17·25	+ 0·03	67 12 5·60	3·6	+ 2·0
α Ceti	2 54 57·83	57·89	− 0·06	86 27 42·81	42·6	+ 0·2
α Persei	3 14 20·72	20·74	− 0·02	40 38 26·72	27·0	− 0·3
α Tauri	4 27 53·43	53·43	0·00	73 46 32·97	31·6	+ 1·4
α Aurigæ	5 6 21·12	21·06	+ 0·06	44 8 57·40	57·2	+ 0·2
β Orionis	5 7 48·63	48·62	+ 0·01	98 21 59·90	59·2	+ 0·7
β Tauri	5 17 26·67	26·69	− 0·02	61 30 54·08	51·8	+ 2·3
α Orionis	5 47 35·59	35·58	+ 0·01	82 37 21·95	21·2	+ 0·8
α Canis Majoris	6 38 58·66	58·63	+ 0·03	106 31 36·23	36·6	− 0·4
α Geminorum	7 25 39·31 39·73	39·29 39·74	+ 0·02 − 0·01	57 48 33·16 30·65	31·8 29·5	+ 1·4 + 1·2
α Canis Minoris	7 31 58·34	58·35	− 0·01	84 25 9·79	9·2	+ 0·6
β Geminorum	7 36 44·68	44·64	+ 0·04	61 38 21·25	20·3	+ 1·0
α Hydræ	9 20 42·44	42·43	+ 0·01	98 3 13·76	15·0	− 1·2
α Leonis	10 0 54·78	54·71	+ 0·07	77 21 0·62	59·4	+ 1·2
α Ursæ Majoris	10 55 3·40	3·51	− 0·11	27 29 39·12	38·6	+ 0·5
β Leonis	11 41 54·98	54·98	0·00	74 38 43·96	43·9	+ 0·1
β Virginis	11 43 24·13	24·20	− 0·07	87 26 47·35	47·7	− 0·4
γ Ursæ Majoris	11 46 27·06	27·25	− 0·19	35 31 37·22	37·2	0·0
α Virginis	13 17 49·27	49·29	− 0·02	100 25 45·54	46·8	− 1·3
η Ursæ Majoris	13 42 1·27	1·27	0·00	39 59 12·81	13·4	− 0·6
α Boötis	14 9 16·62	16·55	+ 0·07	70 5 13·40	12·8	+ 0·6
δ Libræ	14 42 56·87	56·89	− 0·02	105 24 46·90	47·1	− 0·2
α Libræ	14 43 8·31	8·32	− 0·01	105 27 27·41	27·8	− 0·4
β Ursæ Minoris	14 51 9·16	8·89	+ 0·27	15 16 20·65	21·2	− 0·5
α Coronæ	15 28 45·69	45·67	+ 0·02	62 48 42·96	42·5	+ 0·5
α Serpentis	15 37 22·44	22·43	+ 0·01	83 7 52·88	53·0	− 0·1
α Scorpii	16 20 49·70	49·70	+ 0·00	116 7 2·96	2·9	+ 0·1
α^2 Herculis	17 8 16·24	16·23	+ 0·01	75 26 52·77	53·2	− 0·4
α Ophiuchi	17 28 26·22	26·13	+ 0·09	77 20 6·26	5·4	+ 0·9
γ Draconis	17 53 21·34	21·35	− 0·01	38 29 36·01	35·2	+ 0·8
α Lyræ	18 32 11·92	11·89	+ 0·03	51 20 40·73	39·6	+ 1·1
γ Aquilæ	19 39 36·22	36·13	+ 0·09	79 43 31·05	30·7	+ 0·4
α Aquilæ	19 43 57·12	57·08	+ 0·04	81 29 55·32	54·5	+ 0·8
β Aquilæ	19 48 26·14	26·19	− 0·05	83 56 24·92	25·1	− 0·2
α^1 Capricorni	20 9 53·12	53·16	− 0·04	102 56 16·17	18·7	− 2·5
α^2 Capricorni	20 10 17·03	17·08	− 0·05	102 58 33·07	35·2	− 2·1

	Greenwich Mean Right Ascension.	Rad.	G.—R.	Mean N.P.D.	Rad.	G.—R.
	h m s	″	″	° ′ ″	″	″
α Cygni	20 36 39·60	39·47	— 0·13	45 13 6·23	7·3	— 1·1
α Cephei	21 15 14·13	14·18	— 0·05	28 0 24·59	24·8	— 0·2
α Aquarii	21 58 35·50	35·49	+ 0·01	90 59 54·48	55·1	— 0·6
α Piscis Australis	22 49 54·38	54·40	— 0·02	120 21 48·31	47·2	+ 1·1
α Pegasi	22 57 47·33	47·33	0·00	75 32 50·49	50·7	— 0·2
α Ursæ Minoris	1 8 3·05	2·37	+ 0·68	1 26 12·90	13·1	— 0·2
δ Ursæ Minoris	18 17 30·19	30·60	— 0·41	3 23 53·19	52·6	+ 0·6

The agreement, on the whole, between the Greenwich places and those of the *Tabulæ Reductionum* appears rather closer than with the *Radcliffe Observations*.

On the Resolvability of Star-Groups, regarded as a Test of Distance. By Richard A. Proctor, B.A.

There are considerations connected with the resolvability of star-groups which have not hitherto received much attention, so far as I am aware. They bear somewhat importantly on the opinions we are to form respecting the distribution of matter throughout the sidereal system.

In the first place, the resolvability of such clustering aggregations of stars as obviously form part of the sidereal system has been regarded as an important means of estimating the relative extension of different parts of that system. So long as a portion of such a clustering aggregation remains unresolved it has been assumed that the limits of the system in that direction lie beyond the range of the telescope which thus fails to effect resolution, and therefore that the extension of the system in that direction is far greater than in other directions where the same telescope shows the stars projected discretely on a perfectly black background.

In the second place, in the case of definite groups of stars, which either lie beyond the limits of the sidereal system, or if within those limits are yet separated from other parts of the system, and surrounded on all sides by relatively barren regions, it has been commonly assumed that we have, in the telescopic powers necessary to effect resolution, a means of forming a general estimate of the distances at which such groups may lie.

It is my purpose here to indicate certain considerations which point to opposite conclusions as respects both these cases.

If we were to accept the conclusion that where a portion of the galaxy is not resolvable with powerful telescopic aid, the sidereal system has a relatively great extension, it would follow from the smallness of the areas which many of these portions of the galaxy present that there is an extension of the system in those directions into long spike-shaped projections, lying in a di-

rection pointing exactly towards the solar system. When Sir William Herschel, for example, speaks of a region of this sort, of limited extent, which his great 40-feet reflector was unable to resolve, we must accept the conclusion that there is one of these spike-shaped projections extending (according to Sir William Herschel's own estimate) no less than 2300 times further into space than a line drawn from the Sun to *Sirius*. It is not only contrary to every law of probability that this is the real state of the case; but even if we could suppose that in this and in other similar instances such spike-shaped projections could *by mere accident* be directed along lines extending radially from the Sun, that is, if we could get over the argument from probability, there would still remain mechanical objections to our believing in such an arrangement. Knowing as we do that all the stars are in motion under the influence of their mutual attractions, and apparently also under the influence of some other and far greater forces adequate to generate the enormous observed motions, we ought scarcely to be willing to recognise in any part of the system a law of distribution which could not result from any conceivable dynamical processes.

It seems more reasonable to conclude that, where a cluster presents the peculiarity considered, there is not enormous longitudinal extension, but a real peculiarity of constitution; that, in fact, the observer has not been penetrating further and further into space as he increased his telescopic power, but simply analysing more and more searchingly a definite region of space.

In fact, Sir William Herschel, in one of his later papers, was led to consider this as perhaps the true explanation of the matter; for in 1817 we find him saying that his star guagings have in reality more direct reference to the condensation than to the distance of the stars, so that a greater number of stars in the field of view may be explained as well by a greater condensation of that portion of the galaxy, as by a greater extension of its figure in that direction in which the stars appear most numerous.*

Now as regards the case of a distinct cluster of stars, let us consider first the effect of distance on a group of stars all equal in magnitude and separated from each other by equal intervals. Supposing such a cluster so placed that the naked eye could recognise each separate orb, and then to sweep rapidly away into space, would it become nebulous or not before vanishing from view? As the group passed away each separate orb would grow less and less bright, and the distances separating orb from orb would grow apparently smaller and smaller. And clearly if these distances became too small to be distinguished, while the stars of the group yet continued visible, there would result a nebulosity of appearance. But suppose that, on the contrary, the stars of the

* It is rather surprising that in nearly all our treatises on astronomy the earlier papers by Sir Wm. Herschel receive far more attention than those he wrote when at the zenith of his fame. There is only one work I know of (Professor Grant's noble *History of Physical Astronomy*), in which Sir W. Herschel's labours are adequately represented.

group became invisible when the group was at such a distance that the intervals separating star from star would not be indistinguishable (if only the stars were brighter). Then clearly the group would vanish with increasing distance without ever becoming nebulous. Clearly also, if a telescope were employed to bring the retreating group into view, the same conclusions would hold good. A group which would become nebulous to the naked eye before vanishing would become so when examined under a telescope, let the telescope's power be what it might, while a group which would vanish without becoming nebulous to the naked eye would not become nebulous before vanishing under telescopic vision, whatever the telescopic power employed.

It is clear, then, that the nebulosity of a star group, whose members are equal and equally distributed, is a question not of distance merely but of constitution, of the relation between the size and brightness of the constituent orbs and the distances which separate them from each other.

But we may extend such considerations to the case of star-groups containing orbs of different orders of magnitude. Supposing a group of this kind to be passing away into space—as in the former case,—the question whether it would become nebulous at any stage or stages of its progress would depend on the question whether or not the order of stars about to disappear individually were congregated so closely that the eye could not distinguish the distances separating them. Clearly also it might be possible that an order of stars *not* about to disappear might present a nebulous appearance, in which case obviously all lower orders still remaining visible would be involved in that nebulous light. Such a cluster, in passing away from the eye, might also be nebulous at a certain distance, and become non-nebulous at a greater distance; all that would be necessary for such a result being that, while some of the lower orders of stars were distributed richly enough to present a nebulous appearance before vanishing, some of the higher orders should be so sparsely distributed as not to present a nebulous appearance before vanishing, or at any rate for some time after the lower orders *had* vanished.

It is further obvious that the same would be true if the retreating group were watched with a telescope of any power whatever (setting aside all question of the extinction of light in passing through space). The same appearances would be presented in precisely the same order when the group passed (star-order by star-order) out of the range of view of any telescope as when it passed out of the range of the unaided vision.

It follows that, if we apply telescopic power to a given group of stars, we can by no means conclude from the nebulosity of the group under such and such power that the group lies at such and such a distance, unless we are prepared to believe in the existence of certain laws of constitution to which all stellar clusters are subject. But such a belief is not likely to find acceptance with those who are acquainted with the observed variety in the constitution of star-groups.

It happens also that we have direct evidence that irresolvable nebulosity affords no proof of relatively enormous distance. When Sir John Herschel was surveying the neighbourhood of the lesser Magellanic Clouds he found that near the edge the Nubecula Minor was irresolvable with the 18-inch reflector, whereas the heart of this Nubecula could be clearly resolved.* Now it needs no proof that, if the Nubecula Minor (setting aside the nebulæ existing within it) were constituted of stars according to the generally uniform laws assigned to the constitution of the sidereal system, the centre of the Nubecula would be the part whose resolution would be most difficult. It is evident, therefore, that the outer parts of the Nubecula are constituted differently from the central region, and the possibility is suggested that the smaller stars seen in the central region belong in reality to the outer shell, whose real character is indicated by the irresolvability of the outer parts of the Nubecula's *disc* (as distinguished from the Nubecula's substance).

In this instance, then, it is distinctly proved that the irresolvability of a celestial region under Sir John Herschel's 20-feet reflector is no proof of relatively enormous distance. But what is thus proved for a certain telescopic power must be true of all telescopic powers. Hence, whatever the power may be under which a certain region appears nebulous, we have no proof that the stars contained within that region are further off than stars within a region resolvable under that power. But since this must be true of all powers, it must be true of naked-eye vision. Hence the stars forming the galaxy are not necessarily further off than those star-groups which the eye can resolve.

One important conclusion which is, I think, fairly deducible from what has been shown, is that, supposing a spiral of small stars such as I have suggested that the milky way may be, should extend along a part of its length, so far from the eye as to become invisible through distance, we ought not to expect that in passing from the visible part to this invisible portion all orders of resolvability down to utter irresolvability in the most powerful telescopes

* I quote the following passages from Sir John Herschel's *Notes on the Nubecula Minor*. They are all I can find which bear on the question of resolvability.

"The edge of the 'smaller cloud' comes on as a mere nebula."

"In the edge of the cloud vision bad, &c. . . . the cloud is not resolved, and seems a very mysterious object."

"We are now in *the cloud*. The field begins to be full of a faint light perfectly irresolvable."

"I should consider about this place the body of *the cloud*, which is here fairly resolved into excessively minute stars, which, however, are certainly seen with the left eye."

"Re-examined by the side motion the whole cloud, in general and in detail. The main body *is* resolved, but barely. I see the stars with the left eye. It is not like the *stippled* ground of the sky. The borders fade away quite insensibly, and are less or not at all resolved. The body of the cloud does not congregate *much* into knots, and altogether it is in no way a striking object apart from the nebula and clusters."

"Upper limit, *but here it is starry, at the other limit nebulous.*"

ought to be recognised. On the contrary, this part of the spiral might exhibit in succession all the orders of change which the retreating group considered above was shown to be capable of showing (on a certain, not improbable, assumption as to its structure).

But my object is not so much to find evidence in favour of a special theory about a certain portion of the sidereal system as to indicate the varieties of appearance which are to be looked for in different parts of that system, — varieties which are, in fact, as likely to be met with (according to my views of the nature of that system) around the poles of the galaxy as in the richest portions of that wonderfully complex zone.

On an early Telescope made by Giuseppe Campani of Rome.
By John Williams, Assistant Secretary.

At the sale of the late Dr. Lee's instruments, a few weeks since, I purchased an Italian telescope, which, appearing to be of considerable interest as an example of an early instrument by a then eminent maker, I trust I may be excused calling the attention of the Meeting for a few minutes to it.

On examination I found it to be one constructed by the celebrated Joseph Campani of Rome, who was considered as the best maker of telescopes of his day. Thus we find Cassini and other eminent Astronomers of that time employing instruments made by Campani in their astronomical researches.

I have been unable to find any satisfactory biographical account of this able artist, and can only ascertain that he flourished about the middle of the seventeenth century.

Weidler, in his *Historia Astronomiæ*, 4to, 1741, speaks very highly of Joseph Campani, and particularly notices his observations of *Saturn* and *Jupiter*, as well as his excellence as a maker of telescopes. As the quotation from Weidler is rather long and is in Latin, I shall content myself with the summary of his statement by Dr. Long, as given in his *Treatise on Astronomy*, 4to, 1785. His words are "About this time also (1641) Joseph Campani at Rome applied himself to the grinding of glasses for long telescopes, which far excelled all others of that time. Through the munificence of Louis XIV. Cassini had some made by this artist of 100 and 200 palms. Campani saw the shadow of *Saturn's* ring upon his body, as also his zones or obscure belts, and detected the shadows of *Jupiter's* satellites in passing over his body. It was with one of Campani's telescopes that Cassini first saw all the satellites of *Saturn*." Weidler adds, "Longiora quidem telescopia Campanus pauca fabricavit, in quibus, pro coloribus arcendis, tria vitra ocularia adhibuisse dicitur; attamen etiam breviora quæ composuit, 15, 20, 30 pedes longa, singulari perfectione prædita erant, ut ceteris similibus antecellerent." Which may be rendered, "Campani also made a few longer telescopes, in which to neutra-

lise colour, he is said to have applied three glasses in the eye-piece; and the shorter telescopes made by him of 15, 20, and 30 feet in length, were of such extraordinary perfection that they greatly surpassed all others of the same kind." It is also stated that "the Royal Academy (of France) are said to have had excellent telescope glasses of this artist's making which were of 200 and 300 feet focus and magnified four or five hundred times." In the *Speculum Hartwellianum* Admiral Smyth mentions this very instrument as "an old one deserving notice for its respectable age and its tolerable performance."

The telescope to which your attention is now called is one of the shorter ones fabricated by this excellent maker, it being but from 9 to 10 feet in length. The object-glass is 2 inches in diameter, reduced by a diaphragm to 1½ inch, and is ¼ inch in thickness, on it is written with a diamond "Giuseppe Campani in Roma," and the glass of which it is composed is of excellent quality. The eye-piece consists of three plano-convex lenses, the glass of which is of equally good quality, that nearest the eye being fixed and the other two reversible. There are inscriptions in Italian relating to these glasses, one of which reads as follows—"Quando questa parte sta dentro al cannello si vede l'oggetto piu chiaro," *i.e.* when this part is placed within the tube the object is seen clearer. The second is in the same words, excepting that "piu grande" occurs instead of "piu chiaro," implying that the power is increased. One of the Fellows of the Society (Mr. Buckingham), who is well acquainted with telescopes, has tested these powers, and estimates the lower one at about 20 and the higher at 25 times. Upon taking this portion of the eye-piece away altogether, the telescope becomes an astronomical one, and is much increased both in power and clearness. There is also on the eye-piece a nearly obliterated inscription evidently relating to its use for astronomical purposes, together with the letters PALI. XII., which appear to refer to the focal length as being 12 Palms. The Roman Palm is about 9 inches. This would give 9 feet as the focal length, which closely approximates to the truth. The case is composed of nine tubes formed of vellum, which are remarkably strong and light, the whole weight being but 2 lbs. 11 ozs. These tubes draw out in a manner similar to that employed in telescopes of the present day. When closed it is about 2 feet in length, but draws out to about 9 feet when in focus. The workmanship of the whole is exceedingly good.

When it came into my hands it had evidently not been drawn out for many years, and I had great difficulty in extending it to its full length. The glasses also were encrusted with the dirt of years, and required careful cleaning.

In the absence of a better test, I turned it on the word "Admiralty" on the opposite side of the quadrangle of this building (Somerset House), and was very favourably impressed with the sharpness of its definition and the flatness of the field. I have since viewed the Moon through it, and, considering the low power,

was much gratified, and indeed surprised, at the excellence of its performance; the lunar craters appearing, with all the powers, sharp and well defined, and the ragged edge very beautifully shown. The field of view is, however, small, and the instrument rather troublesome to use on account of its length, as, unless very carefully handled and adjusted, the flexure occasioned by the want of suitable support interferes somewhat with its efficiency. With the requisite care, however, it acts very fairly, and I have no doubt, if properly mounted, its performance would be very satisfactory.

Instrument for Sale.

A Transit Instrument, $3\frac{1}{2}$ feet focal length; object-glass, $2\frac{3}{4}$ inches aperture; brass Y's with agate bearings for fixing on stone piers; 3 eye-pieces; micrometer; level; clamp lamp, &c., but wanting the setting circle. Made expressly for a deceased Fellow of the Astronomical Society. Apply to Mr. Williams, Assistant-Secretary, Somerset House.

ERRATUM.

Page 152, line 7 from the bottom, "needle line" should be needle *hole*.

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